input graphics include individual letters of a QWERTY keyboard, individual numbers in a dial pad, and different locations on a map.

4. The Processor

[0040] The user interface system **100** of the preferred embodiment also includes a processor, which is coupled to the displacement device **130** and to the touch sensor **140**. As shown in FIG. **16**, the processor functions to operate the user interface system **100** in an Extended Cavity Mode and a Retracted Cavity Mode. In the Extended Cavity Mode, if the particular region of the surface **115** is deformed, then a user touch that further significantly deforms the particular region of the surface **115** is preferably recognized as a user input of a first type. A user touch that does not significantly deform the particular region of the surface **115**, such as the touch of a user resting their fingers on the deformation, is preferably not recognized as a user input of the first type (and is preferably ignored). In this manner, the deformation of the surface **115** additionally functions to distance the user touch from the touch sensor **140** and to allow the user to rest their fingers on the deformation (the location of an input) without actuating the input. The question of whether a user has significantly or not significantly deformed the particular region of the surface **115** may be set or modified by the manufacturer, by the processor, or by the user. In the Retracted Cavity Mode, if the particular region of the surface **115** is not deformed, then a user touch at the particular region in the surface **115** is preferably not recognized as a user input of the first type, but rather is recognized as a user input of a second type that is distinguishable from a user input of the first type.

[0041] The processor may also function to automatically alter the settings of the user interface system **100**. In a first example, in extremely low temperatures, it may be impossible for the displacement device **130** to modify the volume of the fluid to expand the cavity **125** and deform the surface **115**. The processor may be coupled to a temperature sensor and may disable the displacement device **130** under such conditions. In a second example, in high altitude conditions (or in an airplane with reduced air pressure), it may be impossible for the displacement device **130** to modify the volume of the fluid to retract the cavity **125**. The processor may be coupled to a pressure sensor and may either disable the displacement device **130** (or close particular valves), or may simply adjust the volume of the fluid that is modified under such conditions.

[0042] As shown in FIG. **17**, the processor may also be coupled to the display **150** such that different input graphics may be displayed under the same deformation of the surface **115**, and different inputs may be recognized. As an example, when the cavity **125** is in the extended volume setting, the display **150** may include an input graphic of a first type (such as a letter) and the user input on the deformation would be of a first type (such as a letter), and the display **150** may include an input graphic of a second type (such as a number) and the user input on the deformation would be of a second type (such as a number). When the cavity **125** is in the retracted volume setting, the display **150** may further include an input graphic of a third type (such as an "enter" or "accept" input), and the user input on the touch sensor **140** would be of a third type (such as an "enter" or "accept" input).

[0043] The processor may also function to alter the output of the display **150** to correct or adjust for any optical distortion caused by the deformation in the surface **115**. It is envisioned that, in certain applications, the size of the deformation may cause a "fish eye" effect when viewing the display **150**. The processor, preferably through empirical data, may adjust the output to help correct for this distortion.

[0044] The processor preferably includes a separate and remote controller for the displacement device **130**, a separate and remote controller for the touch sensor **140**, and a separate and remote controller for the display **150**. The processor may, however, integrally include a controller for one or more of these elements.

5. Second Cavity

[0045] As shown in FIGS. **1** and **2**, the user interface system **100** of the preferred embodiment also includes a second cavity **225**. The additional cavities, except as detailed below, are preferably identical to the cavity **125**. In one version, as shown in FIGS. **18***a* and **18***b*, the displacement device **130** is connected to both the cavity **125** and the second cavity **225** and is adapted to expand the cavity **125** and the second cavity **225** together, acting together as an array, thereby deforming more than one region of the surface **115** at the same time. In a second version, the user interface system **100** includes a valve located between the displacement device **130** and the cavity **125** and another valve located between the displacement device **130** and the second cavity **225** to selectively control the fluid flow into the cavity **125** and into the second cavity **225**, respectively. In a third version, as shown in FIGS. **19***a* and **19***b*, the user interface system **100** includes a second displacement device **230** connected to the second cavity **225**, which functions to expand the second cavity **225** and thereby deforming a second region of the surface **115**. The second displacement device **230** is otherwise similar or identical to the displacement device **130**. By separately controlling the displacement device **130** and the second displacement device **23***o*, the cavity **125** and the second cavity **225** may be expanded independently. In a fourth version, as shown in FIGS. **20***a*, **20***b*, and **20***c*, the displacement device **130** is a linear actuator that can either expand the cavity **125** and retract the second cavity **225** (shown in FIG. **20***a*), retract the cavity **125** and the second cavity **225** (shown in FIG. **20***b*), or retract the cavity **125** and expand the second cavity **225** (shown in FIG. **20***c*). This arrangement may be particularly useful in large arrays of cavities, as shown in FIG. **21***a*, where the cavities aligned with a dial pad can be expanded (as shown in FIG. **21***b*) or the cavities aligned with a QWERTY keyboard can be expanded (as shown in FIG. **21***c*).

6. Power Source

[0046] The user interface system **100** of the preferred embodiments also includes either a power source or a power harnessing device, which both function to power the displacement device **130** (and possibly other elements of the user interface system, such as the touch sensor **140** and/or the display **150**). The power source is preferably a conventional battery, but may be any suitable device or method that provides power to the displacement device **130**. The power-harnessing device, which is preferably integrated into the hinge of a flip phone or laptop, functions to harness a portion of the energy involved in the normal use of the electronic device (such as the opening of a flip phone or the screen on a laptop). The power-harnessing device may alternatively be integrated in a separate mechanical input device (such as a button on the side of a mobile phone, or a "self-winding" device found in automatic watches) or any other suitable